Beyond GDP:

Using equivalent incomes to measure well-being in Europe

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ABSTRACT

It has become widely accepted that focusing exclusively on income growth may lead to a too narrow-sighted measure of changes in well-being. People care about other dimensions of life, such as their health, employment, social interactions and personal safety. Moreover, an exclusive focus on income growth remains blind to the distribution of income and well-being in the society. We propose therefore a set of five principles for a richer measure of well-being. In particular, we advocate the use of a measure based on "equivalent incomes", which satisfies these principles. We discuss and illustrate how this equivalent income approach can be implemented in Europe, using the ESS data for 2008 and 2010. We find that introducing inequality aversion and including other dimensions in the analysis leads to a remarkably different perspective on the growth of well-being in Europe.

Keywords : Equivalent income, preferences, growth in well-being, Europe.

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1. INTRODUCTION

Recently, a series of measures of well-being that go "beyond GDP" have been proposed, both in the academic world and in policy circles. In the academic world, inspiration has been found in the so-called Sen-Nussbaum approach to human capabilities as well as in the rapidly growing literature on happiness and subjective well-being. Browsing through the recent issues of this journal, for instance, one can find numerous examples of both approaches.[3] In policy circles, the most popular example of a measure that extends beyond GDP is the Human Development Index (HDI), proposed by the United Nations Development Programme (UNDP). The HDI hinges on the capability approach and measures the performance of countries in terms of their income, health and education. Another example is the "Better Life Initiative" launched by the OECD in 2011 (OECD, 2011). Also the European Commission has stressed the urgent need to collect more and better information for measuring well-being and sustainable development in its Communication on "GDP and beyond" (European Commission, 2009). The European Statistical System is encouraging the collection of the information necessary to construct a multidimensional measure of the quality of life in its different member states (European Statistical System, 2011). All these initiatives have been spurred further by the publication of the so-called Stiglitz-Sen-Fitoussi report in 2009, which took stock of the existing approaches to measuring well-being and strengthened the link between academic insights and the various policy initiatives.

In this paper we will concentrate on the measurement of well-being of the present generations. This question constitutes only one of the streams of the literature that aims to go beyond GDP. An alternative (or complementary) approach focuses on the sustainability of growth, i.e., on the question whether it is possible to guarantee to *future* generations the same living standard as the one that is enjoyed by the current generations. A set of indicators have been proposed to measure sustainability, often aiming at the construction of a corrected or "green" GDP. Safeguarding sustainability is indeed an essential objective, but in our view sustainability is better measured by separate indicators (for instance, by measuring the level of capital that is transmitted to future generations) than by correcting the GDP of the current generation. We consider it therefore a different topic.[4]

There is also some overlap between the literature on going beyond GDP and the research on the development of a comprehensive list of specific policy indicators to gauge progress with respect to multiple policy objectives. An example is the list of social indicators, proposed by Atkinson *et al.* (2002). As another example, the Europe 2020 strategy has put forward a set of specific targets (such as reducing school drop-out rates below 10% or having 75% of the 20-64 years old employed by 2020). Adequate policy surveillance requires the formulation of specific policy targets, but these operational targets often refer to variables that are *inputs* in the process of creating well-being, rather than focusing on the directly important *outputs*, i.e., life dimensions that contribute to well-being. Devoting 3% of the EU's GDP to research and innovation, for instance, (which is one of the

[3] See Diener and Suh (1997) and Bleys (2012) for surveys and a classification, amongst others. A recent theoretical discussion of the various approaches to go beyond GDP is provided by Fleurbaey and Blanchet (2013). See Decancq *et al*. (2014) on the relation between inequality, income, and well-being.

[4] Neumayer (1999) provides a similar argument and Fleurbaey and Blanchet (2013) an extensive discussion. The conclusion that sustainability should be measured separately can also been found in the Stiglitz-Sen-Fitoussi (2009) report – and is underlying the initiatives at the EU and the OECD level.

Europe 2020 targets) is likely to contribute to the future well-being of European citizens, but is not one of the life dimensions about which citizens directly care.

Even within the stream of the beyond GDP literature that focuses on the measurement of well-being, there exists a bewildering variety of approaches. Opinions differ about what are relevant dimensions of life and whether (and how) they should be aggregated. Some claim that aggregation over the various dimensions leads to an unacceptable loss of information (Nussbaum, 2000); others argue that it is unavoidable and can therefore be better done in an explicit way (Fleurbaey and Blanchet, 2013). Some (e.g. Layard, 2005) claim that subjective satisfaction and happiness should be the single criterion to measure well-being (making the discussion on aggregation over the different life dimensions superfluous), while others argue that happiness is too subjective even to be taken up in the list of life dimensions (Adler, 2013; Nussbaum, 2008). In addition, there are the well-known disagreements on how to handle distribution and inequality when we want to measure well-being for society as a whole.

In section 2, we summarize our position with respect to these basic questions by means of a set of principles. Each of these principles can (and should) be debated, but we believe that making the underlying principles of our approach explicit helps to make the debate more transparent. In section 3 we then describe one specific proposal to measure well-being that satisfies our underlying principles: the so-called equivalent income measure. We will discuss what data are needed to implement the concept of equivalent income. It will turn out that it is sufficient to include in a regular fashion a small set of standard questions in existing large-scale surveys. We will illustrate the main features of our approach with data from the European Social Survey for 2008 and 2010. We present the data and our computation method in section 4 and the results in section 5. We find that introducing other dimensions of life in addition to standard income measures changes the ranking of countries in terms of well-being and hence changes our perspective on social progress. Section 6 concludes.

The main purpose of this paper is to convey an intuitive general idea of the equivalent income approach without going into the technical details. More formal and rigorous treatments can be found, *inter alia*, in Fleurbaey and Blanchet (2013), Fleurbaey and Maniquet (2011), Fleurbaey *et al.* (2009) and Schokkaert *et al.* (2011). The concept of equivalent income is discussed and used for intercountry comparisons in recent work by the OECD (OECD, 2014). Also Fleurbaey and Gaulier (2009) have calculated equivalent incomes for different countries. Yet, the countries and the period considered are different, as is the technique to measure equivalent incomes. A direct comparison between their results and ours is therefore difficult.

2. TOWARDS AN AGGREGATE MEASURE OF WELL-BEING: SOME PRINCIPLES

Historically, concepts such as happiness and well-being have been interpreted in many different ways, ranging from an almost metaphysical concept (rooted in religion) to a psychological description in terms of feelings and emotions (McMahon, 2005). Present day discussions are obscured by the lasting presence of many of these interpretations. It should therefore be emphasized from the outset that in the context of policy evaluation, well-being and social progress are essentially political and ethical concepts. Formulating an adequate measure of social progress

involves the implicit or explicit acceptance of a set of objectives that society should strive after. In this section we state explicitly such a set of normative principles. Section 3 then proposes a specific way of operationalizing this approach.

A. FOCUSING ON INDIVIDUAL WELL-BEING

To us, social progress means an increase in the well-being of the individual members of society. This individual oriented view is widely shared among European citizens and policy makers and is arguably the most reasonable position in a democratic society. In the past, the main challenge to this approach came from nationalistic movements formulating objectives directly at the level of the nation, but nowadays even nationalistic ideologies start from the interests of individual citizens – the discussion centers around the definition of citizenship.[5]

It should be clear that the well-being of individuals is not fully determined by their income position or material consumption. Individuals also care about their health, about the quality of their job and their personal relations, about their social interactions and personal safety, and about the natural environment in which they live.[6] The starting point of any encompassing measure of well-being must therefore be the collection of information on these different dimensions of life. As noted above, measuring well-being is very different from creating a dashboard of indicators for evaluating policies. Policy targets are relevant when they are seen as inputs, which indirectly contribute to well-being as outcome. Yet, they should not directly enter into a measure of well-being as their impact on individual well-being may be very different, depending on the characteristics of the individual (providing better public transportation, for instance, may have a very different impact on the effective mobility of different individuals).

We formulate this as a first principle:

Principle 1 (Focus on individual well-being). *The ultimate goal of policy (and the ultimate criterion to evaluate social progress) is the well-being of the individuals making up a society. To measure well-being, information must be collected on the different dimensions of life that are important for this well-being. This information should be about relevant outcomes, and not about inputs.*

Our focus on individual well-being does not exclude that the collective characteristics of a country play an important role. Yet, these collective features should play through their effects on individual well-being. This has the definite advantage that it also allows the integration of distributional considerations in these collective dimensions: a healthy and attractive natural environment and a safe neighborhood are typically local public goods in the economic jargon, and the spacing of the population over the territory is not random. A striking example from the US is discussed by Currie (2011) who shows that pregnant mothers living near a toxic release inventory give birth to less healthy babies – and that low-educated black mothers are heavily overrepresented in the population living in these neighborhoods.

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[5] Even communitarians will argue that community ties are essential mainly because they define what constitutes an individual. The individual remains the central reference point. A recent challenge to our focus on individual human well-being is perhaps the animal rights movement. This issue is not taken up in this paper.

[6] As documented by a large scale survey organised by the World Bank, even the poorest among the globally poor see poverty and well-being as multidimensional notions (Narayan *et al*., 2000). A similar conclusion has been reached by a qualitative study carried out by Eurobarometer in Europe (Eurobarometer 2011).

While the general principle guiding the choice of dimensions seems well-defined, there is still a long way to go before we arrive at a specific list. One can formulate these dimensions at an aggregated (e.g. overall health) or a very specific level (e.g. presence of specific diseases). The former approach may result in a great deal of overlap, the latter approach in a long and intractable list of variables. At a more fundamental level, there are different views on how to justify the choice of relevant dimensions. The most well-known list of dimensions has been proposed by Nussbaum (2000). It is grounded in an objective Aristotelian view of what is essential for human flourishing. At the other extreme, one can situate attempts to base the list on direct questioning of the individuals concerned (see, for example, Clark, 2005). Somewhere in between these two positions we find Sen's (2004) proposal that we decide about the relevant list through public reasoning in a democratic process. Alkire (2002) gives an interesting overview of different lists that have been proposed in the literature. This overview leads to a somewhat surprising conclusion: despite the large variety of approaches and the differences in opinion about the underlying logic, the specific proposals are strikingly similar.

[insert Table 1 about here]

The same is true for the lists that have been proposed for practical applications. There appears to be some consensus to work with a first layer of broader encompassing dimensions that may, if necessary, be made operational through a second layer containing more specific indicators. Table 1 summarizes and compares the lists that were put forward by the European Statistical System (2011) and by the OECD (2011). The similarities are striking. If one accepts (as we do) that the ultimate aim is to arrive at a single synthetic indicator of well-being, the similarities are even more reassuring, since (partial) overlap will be taken care of through the choice of the weights used to get at the synthetic indicator.

B. TOWARDS A SYNTHETIC INDICATOR, CAPTURING CUMULATIVE DEPRIVATION

Suppose that we have reached consensus about a possible list of life dimensions. Many observers prefer to remain at that level and exhibit a strong resistance towards indicator aggregation. As an example, in the present proposals for the European Statistical System it is stated explicitly that "aggregation should be limited to transparent methods with a sound scientific basis agreed upon by the statistical community. (...) Composite indicators combining individual indicators that have no common meaningful unit of measurement and implying arbitrary choices for weighting the sub-indicators cannot be labeled as official statistics and should thus remain in the research or political sphere" (European Statistical System, 2011, p. 13). This position is understandable from the perspective of a guardian of official statistics. There is indeed no consensus about the best aggregation procedure.[7] However, agnosticism at the statistical level should not be translated into a similar agnosticism at the political level. If different situations have to be evaluated in a coherent way, one cannot avoid constructing a synthetic indicator.

[7] Somarriba and Pena (2009) illustrate the low consistency across three methods to compute the weights of a composite well-being indicator for various European countries. Decancq *et al.* (2013) provide a comparison of various weighting schemes based on Flemish data. See Decancq and Lugo (2013) for a critical survey of different methods to select a weighting scheme for a composite well-being indicator.

Let us first make a pragmatic point. The main motivation to go beyond GDP is to broaden the scope of effects that are considered when evaluating policies. When one sticks to the simple enumeration of a list of dimensions, it is likely that for all concrete policy issues one (or a few) dimensions will determine the decision and, more specifically, that the dimensions that are easy to quantify will receive a larger weight than the "softer" dimensions. Since traditional economic growth remains an obvious and natural candidate for consideration, the collection of information on more dimensions threatens to have only a limited impact on decision-making and on the public debate. Going beyond GDP will only become feasible if there is an attractive alternative, which is equally easy to understand and communicate.

There is an additional - and more substantial - problem with rejecting the synthetic approach: explicit and transparent aggregation risks to be replaced by implicit and hidden trade-offs. If the trade-offs are not made in an explicit way, there is a danger that decisions will be incoherent over time, thus leading to a waste of available public resources. In fact, separate decisions may be strongly influenced by volatile public opinion and by one-issue lobby groups, whose relative influence will change over time. One may then (implicitly) give up income in favor of a slight health improvement on one occasion, while on another occasion decisions may lead to a relatively small increase in income at the expense of bad health consequences.

Moreover, constructing a synthetic indicator is the best way of taking account of cases of cumulative deprivation. Assume that sufficient information on the different dimensions is available at the level of the individual citizens. This information can then be summarized in a matrix like the one presented in the light shaded area of Table 2, where x_{ij} refers to the outcome of individual *i* in dimension *j.* There are *n* individuals and *k* dimensions. The usual procedure to summarize the information in Table 2 is to calculate the average values for each dimension: this would result in a vector $(X_1,X_2,...,X_k)$ with one value per dimension, as shown in the dark shaded row in Table 2. Yet, looking only at the averages means that one completely neglects the shape of the distribution within each dimension. Many people will agree that one cannot remain totally blind for inequality. At first sight, the natural way to do so is to complement information about aggregate values with information about the distribution on the different dimensions. This idea is also incorporated in the proposal made by the European Statistical System (2011) that proposes measures such as "the share of people with an equivalized disposable income below the risk of poverty threshold". In Table 2, we summarize such information in the bottom row with the distributional indicators *I(.)* for each dimension.

[insert Table 2 about here]

While this dimension-by-dimension approach is common, it remains blind for so-called cumulative deprivation. Consider the simple example in Table 3, in which we compare two hypothetical situations A and B. In each of these situations, the society consists of two individuals. We suppose that there are only two dimensions to be considered, income and health, and that their values can be measured. In the bottom panel, the poor individual is in the worst health situation and the rich individual in the best health situation, whereas income and health are more mixed in the society described in the top panel. In this simple numerical example, the procedure described above results in an average value of 55 for both dimensions. As for the distributional indicator, we present the ratio between the highest and the lowest value in society: in our example, this is 10/1 for both

dimensions in both situations. The information that would be collected according to a dimension-by-dimension approach is given in italics in the two bottom rows of Table 3. It is completely identical for situations A and B, which would therefore be evaluated as equally good. Arguably, this goes against the ethical intuitions of many.[8]

[insert Table 3 about here]

Let us look now at the last column. Suppose that we measure individual well-being as the simple average for all individuals over all the dimensions (which is a crude assumption, made here only for convenience). Average well-being is the same in situations A and B, but this is definitely not true for inequality in well-being. Both individuals are equally well off in situation A, but the range is 10/1 in situation B. The root cause of the problem is immediately clear from Table 3: in situation B income and health are highly correlated – individual 2 suffers from cumulative deprivation. This is not true in situation A. Looking at the information dimension-by-dimension hides this essential feature of the situation.

It is clear, therefore, that if one cares about cumulative deprivation, one has to summarize the information in Table 2 row-by-row rather than column-by-column. As illustrated in the last column, one then constructs first a synthetic measure of well-being (say $W_i(x_{i1}, x_{i2}, \dots, x_{ik})$) at the individual level and then aggregates these individual measures of well-being to get an indicator of overall social welfare. In Table 2 we introduced an aggregate indicator $SW(W_1, \dots, W_n)$ and an inequality measure $I(W_1, W_2, \dots, W_n)$. We can formulate the basic insight of Tables 2-3 as follows:[9]

Principle 2 (Accounting for cumulative deprivation). *Accounting for cumulative deprivation requires that one first constructs a synthetic index of well-being at the individual level and then aggregates these well-being indices across individuals.*

At this stage we did not yet take a specific position on the form such a synthetic index of well-being should take. As an example, simply counting the number of deprivations for an individual could be interpreted as a (primitive) measure of his (lack of) well-being. However, in the following section, we propose a more ambitious approach.

C. CONSTRUCTING A SYNTHETIC INDICATOR OF SOCIAL WELFARE

If one accepts this second Principle, there are two aggregation steps to arrive at an overall indicator of social welfare. In a first step, an index of individual well-being is constructed for each individual. In

[8] See, for instance, Hausman (2007, p. 50): "A state of affairs in which those who are otherwise worse off are healthier than those who are otherwise more fortunate is *more* just rather than less just than a state of affairs which is exactly the same except that health is equally distributed". Or, in another context, Pogge (2002, p. 11): "Consider institutional schemes under which half the population are poor and half have no access to higher education. We may plausibly judge such an order to be more unjust when the two groups coincide than when they are disjoint (so that no one bears both hardships)". Ferreira and Lugo (2013) discuss the importance of cumulative deprivation for multidimensional poverty measurement. See Decancq (2014) on the impact of neglecting cumulative deprivations when measuring well-being in Russia.

[9] This principle is aligned with Recommendation 8 of the Stiglitz-Sen-Fitoussi report (2009): "Surveys should be designed to assess the links between various quality-of-life domains for each person, and this information should be used when designing policies in various fields".

the second step these indices are aggregated across all individuals. For both steps one has to take an essentially normative position, but the underlying logic is very different.

AGGREGATION 1. CONSTRUCTING AN INDEX OF INDIVIDUAL WELL-BEING

When considering how to weigh the different dimensions in the construction of an individual index of well-being, we are immediately confronted with the fact that different individuals have different ideas about the relative importance of the different dimensions (have different "preferences" in the economic jargon).[10] Some people are willing to run considerable health risks to earn a larger income; others spend a large part of their time exercising and try to follow a healthy diet. Some prefer to live in a lively city with a rich supply of cultural events and many opportunities for social interactions; others prefer to live in a quiet natural environment. Is it then acceptable to impose one uniform view about what is a good life on all these citizens? We suggest that this is hard to defend if one accepts Principle 1 (Focus on individual well-being) and that it is much more natural to impose the following principle.

Principle 3 (Respect for individual ideas about a good life). *The weighting scheme applied to construct the measure of individual well-being should respect the individual ideas about what is a good life.*

This principle immediately discards the use of so-called objective indices with weights that are *a priori* fixed by the analyst (or the policy maker). It also offers another perspective on the question of incommensurability of dimensions and on the position of the European Statistical System against indicator aggregation. Indeed, we agree with the European Statistical System that there is no good theoretical framework to aggregate the different dimensions at the global level when one follows the common approach of collecting the information dimension-by-dimension. Things change, however, when one first computes a measure of individual well-being (as advocated in Principle 2), and even more so if one accepts Principle 3. Throughout their lives, all individuals take decisions involving trade-offs between the different dimensions – and/or evaluate their lives in these terms. At the level of individual evaluation, the different dimensions of life are treated as commensurable. The construction of an individual measure of well-being is a necessary first step to arrive at a meaningful synthetic indicator of social progress.

It is important to be explicit about the consequences of Principle 3. Using individual-specific weights implies that preferences play an essential role in the construction of the measure of individual well-being. It is then possible that two individuals that are in exactly the same "objective" situation, i.e. reach the same value for all life dimensions, are ascribed a different level of well-being. To give an example: getting ill will have a stronger effect on the well-being of individual *i* than on the well-being of individual *j* if the former gives a relatively larger weight to health. Principle 3 has also consequences for the evaluation of developments over time: if an individual remains in exactly the same objective situation, but his preferences change, his well-being will be affected. There is indeed a deep conflict between "objective" approaches – applying the same weights for everyone – and "preference-based" approaches – respecting the life conceptions of the individuals themselves.

[10] When we talk about preferences in this paper, we refer to the individual conception of a good life. This Rawlsian concept includes the values and normative convictions of the individuals and should not be reduced to their mere egoistic self-interest, nor is it necessarily "revealed" in their choice behaviour.

Different citizens and analysts may take a different position in this respect. On the one hand it may look weird to speak about "social progress" if nothing has changed in the objective situation of a country, and only the preferences of the citizens have changed. On the other hand, it also looks weird to claim that two countries have experienced the same increase in well-being if the improvement has been in a dimension that is only considered relevant by one of them. In this paper we explore the possibility of an approach, reflecting Principle 3, but obviously other approaches are possible.

Recently, happiness or life satisfaction measures have attracted much attention – typically based on survey questions of the type: "Everything considered, how satisfied are you with your life?" Similar questions have now been asked in dozens of surveys to thousands of respondents and the answers turn out to be robust.[11] They show convincingly that life satisfaction does not only depend on material living conditions, but also on almost all dimensions enumerated in Table 1. If this is the case, and if we want to respect individual preferences, one may be tempted to simply use these satisfaction measures as indicators of individual well-being. Moreover, life satisfaction can be measured in a rather straightforward way. Are we – as observers – not complicating things unnecessarily by constructing a synthetic indicator of well-being ourselves, rather than leaving this to the responsibility of the respondents in a survey? Does social progress not ultimately consist in increasing happiness?

In fact, measuring social progress in terms of the total happiness in the society boils down to a simple revival of traditional Benthamite utilitarianism. This is not the place to go into the everlasting philosophical debate on the pros and cons of utilitarianism, but we want to stress that measuring individual well-being in terms of subjective satisfaction does *not* respect personal preferences. This at first sight surprising insight is related to what Sen (1985) has called the problem of "physical-condition neglect": subjective satisfaction is grounded on the mental attitude of the person, and risks to neglect his or her real physical conditions. Subjective satisfaction is not only determined by objective characteristics of life and by opinions on what is a good life, but also by aspirations and expectations – and the latter adapt to the objective circumstances: "A person who is ill-fed, undernourished, unsheltered and ill can still be high up in the scale of happiness or desire-fulfillment if he or she has learned to have 'realistic' desires and to take pleasure in small mercies" (Sen, 1985, p. 21).

Physical-condition neglect and adaptation are not mere philosophical notes in the margin. The empirical literature on subjective satisfaction has shown that adaptation is a pervasive real-world phenomenon. The most striking examples are situated in the sphere of health. Countries with higher rates of HIV prevalence do not systematically report poorer life (or even health) satisfaction, yet individuals (and countries) care about HIV and prefer to have a lower rate (Deaton, 2008). Individuals who have lost a limb may, after adaptation, recover a good satisfaction score – but still express a strong aversion to disability (Loewenstein and Ubel, 2008). If one accepts (as we do) that

[11] To be precise, researchers still disagree about the relative importance of cognitive and affective components in the question and about the reliability of the questionnaire method (see, for example, Kahneman and Krueger, 2006). Various proposals have been made to measure social progress using subjective well-being measures such as life satisfaction and happiness. See, Veenhoven (1996) for an early proposal to compute a "happy life expectancy" (life expectancy times average happiness on a [0-1] scale). Recently, the World Happiness Report (Helliwell *et al.* 2013) provides a comparison of happiness across the world.

the poor and the ill are still poor and ill (and would prefer to be rich and healthy), even if they have learnt to embrace their lot, i.e., if one wants keep to our Principle 3, then subjective satisfaction cannot be taken as an adequate measure of overall well-being. Other ethical observers obviously may take a different position. This illustrates that choosing measures of individual well-being is ultimately a normative problem.

Even if one accepts that subjective satisfaction cannot act as an encompassing measure of individual well-being, this does not imply that happiness is completely irrelevant. "It would be odd to claim that a person broken down by pain and misery is doing very well" (Sen, 1985, p. 17). Yet, feelings of subjective happiness or satisfaction are only part of the story. They can best be seen as one specific element in the vector of life dimensions. This is also the position taken by the European Statistical System and by the OECD (see Table 1). By virtue of Principle 3, the relative importance given to the dimension affective happiness may differ from individual to individual. In the light of the present debate and the growing popularity of measures of subjective satisfaction, it is good to formulate our position as a fourth principle:

Principle 4 (Avoidance of physical-condition neglect). *Happiness (or subjective life satisfaction) may be one of the important dimensions of life, but it should not be seen as an encompassing measure of individual well-being.*

The question remains open on how to implement Principles 3 and 4, now that we have discarded two popular approaches to measure well-being: objective measures with weights that are set *a priori* by the policy makers or the analysts and direct measures of subjective satisfaction. In the next section we will propose a new approach that is in some sense intermediate between these two extreme positions. Perhaps surprisingly, it will turn out that the empirical results on subjective satisfaction may still be very useful for the empirical implementation of this concept.

AGGREGATION 2. CONSTRUCTING AN INDEX OF SOCIAL WELFARE

Assume we have found a measure W_i representing the well-being of individual *i*. We still face the question of how to aggregate these values of W_i for the different individuals to arrive at an overall measure of social welfare, i.e. what weights to give to the different individual well-being levels. We share the opinion of the large majority of citizens in Western countries that this aggregation should be distribution-sensitive, i.e. that improvements in the well-being of the relatively worse-off should get a larger weight than improvements in the well-being of the better-off. This can be operationalized by introducing a parameter of inequality aversion in the calculation of social welfare.

In broad lines, there are two possible approaches to set the value of this parameter of inequality aversion. The first approach takes it as an empirical fact – different citizens, groups or societies care to a different extent about inequality. However, using these observations as the basis for setting the parameter of inequality aversion in the calculation of social welfare just shifts the aggregation problem at another level: how then to aggregate different opinions about inequality? In our view, there is an even more basic ethical problem with this "empirical approach". It would imply that inequality in society is no longer important if individuals did not care at all about others. We therefore follow a second approach, which is dominating in the philosophical literature. In that second approach, setting the parameter of inequality aversion is a normative choice. It is a question of justice, which cannot be settled by starting from individual preferences. The inequality aversion

parameter has to be introduced directly as a distributional characteristic at the collective level. The consequences of different opinions can then be analysed through a sensitivity analysis. Note that this approach does not create an inconsistency in our treatment of individual preferences. Our position that individual preferences should be respected when constructing an individual measure of well-being did not follow from these individual preferences themselves either, but was also based on a normative perspective and a specific view of justice.

A natural way to introduce such a concern for inequality is to start from average well-being *M* and to penalize it by a measure of the inequality of its distribution I_ρ. Hence, we can write social welfare *SW* as

$$(1) \quad SW = M\big(1 - I_\rho\big).$$

The inequality measure I_ρ can be specified in different ways. One possibility (implemented in our empirical illustration) is to select I_ρ from the so-called S-Gini family of inequality measures (Donaldson and Weymark, 1980), which defines inequality as a weighted average of the ratios of the well-being level W_i and *M* for each individual:

$$(2) \quad I_\rho = 1 - \sum_{i=1}^{n} \left[\left(\frac{n-i+1}{n} \right)^\rho - \left(\frac{n-i}{n} \right)^\rho \right] \frac{W_i}{M}$$

All individuals are ranked from worst-off to better-off, so that *i* reflects their position in the distribution. The weights for each individual are then given by the term between square brackets. These weights are larger for individuals with a lower position in the overall well-being distribution if ρ > 1. This parameter ρ, which can be interpreted as the degree of bottom sensitivity of the inequality index, offers a convenient way to capture differences in opinion on what justice requires. The pattern of weights attached to different positions in the income distribution for different values of ρ is shown in Figure 1. If ρ = 1, all individuals get the same weight in expression (2), i.e., 1/n, so that I_ρ equals 0 for any distribution and expression (2) reduces to the simple average. If ρ goes to infinity, we give weight exclusively to the bottom of the distribution and expression (2) reduces to 1 – W_1/M so that expression (1) collapses to W_1, the well-being of the worst-off. This is the Rawlsian position. Intermediate values of ρ represent positions in between these two extremes. Figure 1 shows the weights for the cases ρ = 5 and ρ = 2. Note that in the former case, individuals with an income above the median (percentile 50 and above) get a very small weight. The case ρ = 2 (with linearly declining weights) is particularly interesting, because the inequality measure in expression (2) then becomes the Gini coefficient.

[insert Figure 1 about here]

We summarize this brief discussion as:

Principle 5 (Inequality aversion). *Justice requires to take into account the inequality among the individual indices of well-being. This can be done in a natural and flexible way by introducing an inequality aversion parameter in the social welfare function, implying that an improvement in the well-being of the relatively worse-off has a larger effect on social welfare than an improvement in the well-being of the relatively better of. Inequality aversion is a normative parameter, that is not necessarily related to individual preferences.*

3. A SPECIFIC PROPOSAL: EQUIVALENT INCOMES

In the previous section, we advocated a set of five basic principles that measures of individual well-being and social welfare should satisfy. Neither subjective satisfaction nor the existing objective measures satisfy these principles. We will now propose a concept of well-being that does: the equivalent income.[12] We first introduce the basic idea and then discuss how it can be operationalized.

A. INTRODUCING EQUIVALENT INCOMES

We start from a situation (see Figure 2) in which two individuals agree on what is a good life. Both Ann and Bob prefer Ann's life (in A) to Bob's life (in B). In this case, Principle 3 requires us to accept that the well-being of Ann is greater than that of Bob. Note that this does *not* imply that Ann is necessarily happier than Bob. It is very possible that Ann comes from a rich family and has a long experience of being healthy – while Bob's situation may have improved considerably compared to that of his deprived parents. The aspirations of Ann may then be much more ambitious – and she therefore may feel worse off than Bob, despite the fact that she would not be willing to change position with him. This is precisely a situation of adaptation of satisfaction to aspirations, as was described in the previous section.

[insert Figure 2 about here]

The comparison between Ann and Bob in Figure 2 is relatively straightforward. The more challenging (but also more realistic) case is one in which both individuals have different ideas about what is important in life, i.e., they have different preferences. In Figure 3, Ann and Bob disagree on the good life, which can be seen from their crossing indifference curves. Bob (in situation B) would in fact prefer to be in the situation of Ann, but at the same time Ann would prefer to be in the situation of Bob. How are we going to say which of the two individuals is worse or better off in such a case of mutual envy?

[insert Figure 3 about here]

Let us recall our starting point: the choice of a well-being measure is *not* a metaphysical or a psychological question, but rather an ethical or political one. When we claim that Ann is better off than Bob, this means that someone who is concerned about inequality is justified to draw the conclusion that redistribution from Ann to Bob would be an improvement from the social point of view. Whereas it is common to think of redistribution in terms of income, it is not straightforward – or even possible – to redistribute health (or outcomes in other dimensions of life). Hence, a natural question to ask at this point is the following: under what conditions can we reduce the multiple dimensions of well-being to the income dimension only, i.e., under what conditions is it possible to

[12] We face a danger of terminological confusion here. The term "equivalent income" is commonly used to indicate the "income corrected by using an equivalence scale" (mainly to take account of differences in household composition). Although closely related, this does not perfectly coincide with the interpretation we will give to the concept. However, this latter interpretation also has a long tradition, and the term is explicitly used at least since the work of King (1983) – see Fleurbaey and Blanchet (2013) for a sketch of the historical background. In the light of that literature it would be equally confusing not to use the term "equivalent income" in this paper. We therefore prefer to stick to it, but warn the reader for the possible confusion.

state that a redistribution of income from Ann to Bob would indeed lead to a more equal distribution of well-being, or, equivalently, that Ann is better off than Bob if her income is larger? This is obviously not true in general. In Figure 3 there is no *a priori* reason to say that Ann is better off in situation A than Bob is in situation B. She is indeed richer, but at the same time she is also less healthy.

Now consider a situation in which Ann and Bob have the same suboptimal health. Even then, it is not straightforward to compare their well-being on the basis of their income alone, since one individual may care more about being sick than the other. Figure 3 illustrates. Suppose that both Ann and Bob were in the same situation X, in which they are equally (un)healthy and also have the same income. However, as shown by the crossing indifference curves, Ann and Bob have different ideas about what is important in life. Indeed, as the indifference curve of Ann is steeper compared to the indifference curve of Bob, health is relatively more important for her than it is for Bob. In other words, Ann is willing to give up more income for an improvement in her health. Applying Principle 3 then suggests that her level of well-being is lower.

Let us therefore go one step further and consider a situation in which two individuals are not only equally healthy, they are in addition both perfectly healthy. Such a situation is represented in Figure 3 if we were to compare situations A' and B'. We suggest that in such a comparison between two individuals who are perfectly healthy, the individual with the largest income can be seen as better off. In other words, it seems natural to state that differences in the weight given to health by different individuals become irrelevant if they are both in perfect health. Take the individual in B' who has the highest income. Can he legitimately claim that he is worse-off than someone in A' with a smaller income, because he cares less about being healthy?

While we focused our example in Figures 2 and 3 on combinations of income and health, the reasoning also extends naturally to other non-income dimensions. From the previous discussion, two basic intuitions can be distilled. First, if we want to respect individual ideas about what is a good life, two situations that are seen by the individual as equally good also correspond to the same level of well-being for policy analysis. Second, if all individuals obtain their most preferred situation on a non-income dimension, the importance given to this dimension should not influence the ranking of their well-being. Obviously, these intuitions reflect normative positions, which should be judged on the basis of their ethical acceptability. Certainly the second one is debatable.[13] However, once we accept them, we can immediately derive an interesting concept of individual well-being that can be made operational. This is the *equivalent income*.

Say that we want to compare the well-being of Ann in situation A with the well-being of Bob in B as they are depicted in Figure 3. Our first intuition implies that Ann reaches the same level of well-being in situation A and in A' and that Bob reaches the same level of well-being in situation B and B'. Our second intuition implies that A' and B' can be ranked on the basis of income only – these incomes are denoted in the figure as equivalent income (for Ann in) A and equivalent income (for Bob in) B. These equivalent incomes measure the well-being levels of the two individuals. In this

[13] The second principle is *not* necessary to support the idea of equivalent income. Equivalent incomes can be calculated for any choice of reference values of the non-income dimensions (see, for example, Fleurbaey *et al.*, 2009). However, the choice of the "best" value as reference is an attractive choice. See Fleurbaey and Blanchet (2013) for an extensive discussion.

case, it turns out that Ann is worse off in A than Bob is in B, despite the fact that Ann is richer. The reason is clear: in situation A, Ann has a lower level of health and health is relatively important for her. In more general and abstract terms, we can define the equivalent income as follows.

Definition (Equivalent income). *The equivalent income of an individual is the hypothetical income that, if combined with the best possible value on all non-income dimensions, would place the individual in a situation that he/she finds equally good as his/her actual situation.*

Note that the equivalent income crucially depends on the individual ideas about what is a good life. We discussed this already when we introduced Principle 3. If both Ann and Bob were in the same situation X, the equivalent income of Ann would still be lower because she suffers more from poor health. In addition, equivalent income has all the pleasant operational features of monetary income. It can easily be interpreted in cardinal terms and can be used without any problem in the computation of social welfare and inequality according to expressions (1) and (2). In fact, the difference between Ann's income in A and her equivalent income simply is her willingness-to-pay for perfect health. To some, the use of a monetary measure may seem to imply a return to the money fetishism that we wanted to leave behind us when going beyond GDP. These feelings are understandable, but they are misplaced. As the example illustrates, the ranking of well-being in terms of equivalent incomes may be very different from the income ranking. What really matters is not the monetary measurement, but the assumption of commensurability, i.e., the basic idea that it is meaningful to define trade-offs between the different dimensions and that the correct way to make these trade-offs is to respect the ideas on the good life held by the individuals themselves.

Note also that the equivalent income is always lower than the actual monetary income, unless the individual reaches the best possible level for all non-income dimensions. This has a very natural interpretation: the difference between the equivalent and the actual income reflects the decrease in well-being that results from not reaching these best possible levels, and this decrease is measured in money terms. Of course, this also implies that adding additional non-income dimensions necessarily lowers the equivalent income. This may seem counterintuitive if one tries to compare the values of well-being for different definitions of the vector of non-income dimensions. Yet, such comparisons do not make much sense. Different vectors of life dimensions imply psychologically and socially different concepts of well-being, and the resulting calculated values cannot be compared in a meaningful way.

B. COMPUTING EQUIVALENT INCOMES

To compute equivalent incomes, we need information about the position of (a representative sample of) all individuals in society on a given list of relevant life dimensions. In addition, we also need information about their preferences, i.e., about the individual weights given to these different dimensions. Promising results have been found in three directions.

First, for those dimensions about which individuals have some choice, their preferences can be revealed by observed behavior, if we are willing to assume that their choices are based on correct information. The most straightforward application here is with labor market data (Bargain *et al*., 2013). Second, since the difference between income and equivalent income equals the individual willingness-to-pay to be in the best possible situation on the non-income dimensions, well-known stated preference techniques such as contingent valuation can be used as well. Equivalent incomes

have been calculated with this technique by Fleurbaey *et al*. (2013). A third method, starting from information about life satisfaction, has been applied by Fleurbaey *et al*. (2009) and, for the specific case of job characteristics, by Schokkaert *et al*. (2011). One of its main advantages is that it can be easily implemented with data from a survey that contains individual information about life dimensions and about life satisfaction. Since this is the method that will be applied in our own empirical application in this paper, we will discuss it in some more detail.

It may seem surprising that we have rejected life satisfaction as a synthetic indicator of well-being and nevertheless use it to calculate equivalent incomes. However, it is possible to distinguish between two sources of information that are present in satisfaction questions. First, they give information about the *level* of satisfaction of the individual. We argued above that this information on satisfaction levels may be influenced by aspirations and expectations and should therefore not be used as a synthetic well-being indicator. Second, if we accept the reasonable assumption that the *relative importance* respondents attach to the different life dimensions is reflected in their overall judgment, then we can derive from their answers useful information about the shape of the indifference curves in Figures 2 and 3. In fact, the approach of deriving willingness-to-pay from empirical regressions of subjective satisfaction is a popular one (see, for instance, Clark and Oswald, 2002). It is exactly this second source of information that can be used to compute equivalent incomes.[14]

Call y_i the income of individual *i*, x_i the vector of relevant non-income dimensions of life, z_i a vector of personal characteristics that are not part of the relevant dimensions of life, such as gender, age and country of origin, and S_i her life satisfaction. The satisfaction of individual *i* can then be written as:

$$(3) \quad S_i = \alpha + (\mu + \pi' z_i) ln y_i + (\beta + \gamma' z_i)' f(x_i) + \delta' z_i + \varepsilon_i,$$

where ε_i is a disturbance term and the decreasing returns of each of the non-income life dimensions are captured by the Box-Cox transformations

$$(4) \quad f(v_i) = \frac{{v_i}^{\tau} - 1}{\tau}.$$

When the transformation parameter τ equals 1, the transformation of the dimension is linear. The smaller the parameter, the larger the concavity of the transformation and the larger the degree of decreasing returns of the considered dimension on life satisfaction. When τ goes to 0, the transformation function becomes the logarithm. The coefficients to be estimated are the scalars α and μ, and the vectors ($\pi, \beta, \gamma, \delta, \tau$).[15]

An increase in income and in the relevant life dimensions *x* increases satisfaction. An increase in *z* also affects satisfaction, but since *z* does not include relevant dimensions of life, we interpret it as

[14] Interestingly, in this approach of retrieving opinions on the good life from subjective life satisfaction regressions, there is an echo of the conclusion of Diener and Suh (1997 p. 214) in their comparison of economics, social and subjective indicators of quality of life: "[A] complete understanding of objective indicators and how to select them requires that we understand people's values, and have knowledge about how objective indicators influence people's experience of well-being".

[15] A more flexible model, which relaxes the assumption $\tau_y = 0$ and allows for a flexible Box-Cox transformation of the income dimension, is feasible but unnecessarily complicates the mathematical expressions for the equivalent income in the following. As will become clear below, the simplifying assumption of a logarithmic transformation of income is not rejected by our data.

capturing aspirations and expectations. Note that some of these individual characteristics are also influencing the effect of income and the other quality dimensions *x* through an interaction effect. This interaction effect allows us to account for the possibility that individuals with different personal characteristics may have different ideas about what is important in life. Of course, how strong this effect is and in which direction it goes is an empirical matter.

Recall that the equivalent income is defined as the hypothetical income that, if combined with the best possible value on all non-income dimensions, would place the individual in a situation that he or she finds equally good as his or her initial situation. If we indicate these best possible values by $\bar{x}$ and the equivalent income of individual *i* by y_i^*, we can write:

$$S_i = \alpha + (\mu + \pi' z_i) ln y_i + (\beta + \gamma' z_i)' f(x_i) + \delta' z_i + \varepsilon_i =$$

$$\alpha + (\mu + \pi' z_i) ln y_i^* + (\beta + \gamma' z_i)' f(\bar{x}) + \delta' z_i + \varepsilon_i,$$

and therefore

$$(5) \quad y_i^* = y_i exp\left[\left(\frac{\beta + \gamma' z_i}{\mu + \pi' z_i}\right)'(f(x_i) - f(\bar{x}))\right]$$

This expression is intuitive. The equivalent income will increase with x_i and the size of that increase is determined by the relative importance of x_i as compared to income.[16] If the individual reaches the best possible value $\bar{x}$ for all dimensions, the equivalent income becomes equal to the actual income (see also Figure 3). Personal characteristics z_i enter the expression (5) in so far as they affect the relative importance given by individual *i* to the various dimensions of life. By construction differences in aspirations (as captured by the coefficients δ) do not have an effect on equivalent income, nor do the idiosyncratic differences captured in the disturbance term ε_i.

4. DATA AND ESTIMATION

To compute equivalent incomes for various European countries, we use the European Social Survey (ESS). The ESS is designed to chart the interaction between Europe's changing institutions and the attitudes, beliefs and behavior patterns of its citizens. Since 2002, data has been collected every two years in more than thirty nations. For our purposes it is a useful data set as it contains information on a number of life dimensions and on life satisfaction. We focus on 2008 and 2010 (waves 4 and 5) of the survey. We do so for two reasons. First, this allows us to study the development of well-being during the turbulent period of the outbreak of the worldwide financial crisis.[17] Second, in wave 4 the ESS method of collecting household income information has been considerably improved, which complicates comparisons with the earlier three waves.

[16] As in all regression analyses, changing the scale of the *x*-variables will also change the scale of the estimated coefficients. These should therefore be interpreted cautiously. However, as eq. (5) shows, it is the product $(\beta + \gamma' x_i)' f(x_i)$ that appears in eq. (5). Therefore, changes in the scaling of the independent variables will not affect the calculated equivalent incomes.

[17] As the survey was organized at the end of the calendar year, it is supposed to describe the situation of the individuals in 2008 and 2010.

Yet, the ESS is not the ideal data set to compute equivalent incomes.[18] First, the income information in the ESS is rather crude and based on a single question. Household heads report their total household income by indicating the income decile to which they belong.[19] Second, the ESS is a repeated cross-section and not a panel survey, which makes it difficult to control for individual-specific time-invariant characteristics in the life satisfaction regression. It is well-known, for example, that personality traits are important determinants of life satisfaction and that not controlling for them may lead to biased estimates of the other coefficients (see Ferrer-i-Carbonell and Frijters, 2004).

In Table 4 we summarize the life dimensions that are included in our analysis and how they are measured in the European Social Survey. A comparison with Table 1 shows that most of the dimensions listed by the European Statistical System are included, except Education, Natural and living environment, Experience of life and Governance and basic rights.[20] We return below to the question why we did not include education as a life dimension.

[insert Table 5 about here]

Table 5 provides summary statistics for each of these variables for the 18 countries considered in our analysis. We include countries for which we have data on the key variables in both waves, leaving us with 15 EU-members and Switzerland, Norway and the Russian Federation.[21] The third column of Table 5 provides the average responses on the life-satisfaction question: "All things considered, how satisfied are you with your life as a whole nowadays?" Answers range from 0 (extremely dissatisfied) to 10 (extremely satisfied). Denmark (DK) stands out as the country with highest average life satisfaction and Hungary (HU) and the Russian Federation (RU) score lowest. By virtue of the uprating procedure described in Appendix 1, the average incomes in column four coincide with the Real Net National Incomes time series reported by the OECD. Norway (NO) is the richest country and

[18] Within the European context, alternative data sets to compute equivalent incomes are the Statistics on Income and Living Conditions (SILC), the Survey of Health, Ageing and Retirement in Europe (SHARE), and the European Quality of Life Survey (EQLS) (Eurofound, 2012). The available SILC data do not contain a life satisfaction question and do not allow to estimate preferences. The SILC 2013 contains an ad-hoc module on well-being, but at the moment of writing these data were not yet available. The SHARE data only cover the population that is 50 years and older. Interestingly however, the latter data set includes also a set of so-called anchoring vignettes that allow to correct for scale heterogeneity in self-evaluations of life satisfaction (see Angelini *et al.* 2012).

[19] The country and time-specific cut-offs of these income deciles are taken from an external source. After converting the reported deciles to their corresponding monetary values (by taking the midpoint of each interval), some discrepancies remain between the ranking of the countries according to the average income in the survey and the well-established macro-figures. In addition, corrections for price differences have to be made to allow for comparisons between countries. Therefore we apply an uprating procedure of all incomes such that the country average total household income per capita coincides with the "Real net national income at the price levels and PPPs of 2005" as provided by the OECD on 28/1/2013. Appendix 1 provides more details.

[20] "Experience of life" and in particular happiness, could in principle be included in the analysis, as the ESS also includes a happiness question "Taking all things together, how happy would you say you are?". We have decided not to take this variable as a dimension of life because of its very high correlation with life satisfaction. This common finding may hint at the confusion between the evaluative question on life satisfaction and the affective question on happiness. See also Fleurbaey and Blanchet (2013).

[21] Countries included in the analysis are Belgium (BE), Switzerland (CH), Czech Republic (CZ), Germany (DE), Denmark (DK), Estonia (EE), Spain (ES), Finland (FI), France (FR), Great Britain (GB), Greece (GR), Hungary (HU), Netherlands (NL), Norway (NO), Poland (PL), Russian Federation (RU), Sweden (SE) and Slovenia (SI).

Hungary the poorest. Column five describes the health situation of the respondents, measured by their self-assessed health. Although self-assessed health is a good predictor of, for example, mortality, caution is needed with international comparisons (see Jürges, 2007). On average, citizens in Greece (GR) are most healthy. Unemployment rates are given in column six, with notable increases in unemployment figures between 2008 and 2010 for Spain (ES) and Greece. The next column presents average social interactions scores measured on a 1 to 7 scale. Lowest scores are obtained by the former communist countries (see also Howard, 2002). Column eight presents the average feeling of safety on a 1 to 4 scale, where lower numbers indicate countries that are more unsafe, such as Russia and Greece. Switzerland (CH) and, again, Norway perform best on this dimension. The final three columns present the occurrence of some socio-demographic characteristics in the sample: being younger than 48, being female or having enjoyed higher education.

[insert Table 6 about here]

As described above, the first step to compute equivalent incomes involves the estimation of the life satisfaction equation (3). After pooling observations across all countries and both waves, we obtain a data set with about 52,000 observations. We use an ordered logit estimation to account for the ordinal nature of the responses on the life satisfaction questions.[22] Table 6 presents the coefficients that are necessary to compute equivalent incomes. In this estimation we include various control variables to capture aspirations and expectations of the respondents such as their household size, education, education (squared), gender, age, age (squared), marital status, dummies for being religious, urban, belonging to an ethnic minority, and a time and country dummy. The coefficients obtained for these control variables all stand to reason, but are not reported for the sake of brevity.

In the first row of Table 6, one finds the coefficient of logarithm of income of an individual in the reference group (who is older than 48, male and without higher education).[23] This coefficient (μ in expression (4)) is 0.375 and significant at the 0.1% level. The non-income dimensions are presented in the next rows. The dimension-specific Box-Cox transformation parameters are determined to maximize the overall fit of the model (Box and Cox 1964). Among the non-income dimensions, the decreasing returns are found to be largest for social interactions ($\tau = 0.34$) and smallest for safety ($\tau = 0.95$). Individuals in the reference group who are healthier report higher life satisfaction, whereas the unemployed report a lower life satisfaction. More social interactions and feelings of better personal safety are also associated with higher life satisfaction.

The method based on a life satisfaction regression cannot provide individual-specific coefficients for the dimensions of life. At best we can account for the heterogeneity between broad socio-demographic groups. The interaction effects (π) are given in the final six rows of Table 6.[24] We find that women and higher educated individuals have a higher coefficient of income. The young and higher educated care less about their health, women care less than men about being unemployed

[22] Estimating the same equation with ordinary least squares leads to very similar results.

[23] A more flexible procedure with a Box-Cox transformation for income leads to an estimate of the transformation coefficient $\tau_y = - 0.01$. This is indeed very close to 0, supporting the choice of the logarithmic transformation (see also Layard *et al.* 2008).

[24] We started from the full set of 15 possible interaction effects between the five dimensions and the three considered socio-demographic variables, and then we have dropped consecutively the least significant terms until reaching the presented parsimonious model with all remaining interactions significant at the 10% level.

and about safety (but both dimensions remain important for them).[25] Even with our crude method, we already find quite some disagreement on the relative importance of the dimensions of life. This finding makes Principle 3 also empirically relevant.

The final necessary ingredient for the computation of the equivalent incomes involves the choice of the best possible values in each of the non-monetary dimensions of life ($\bar{x}$). In general, these "best" possible values will depend on the preferences of the individuals.[26] However, for the dimensions taken up in our analysis the choice is easy since the variable used to measure the outcomes of the individuals is bounded and the respondents express a clear and unanimous opinion on what is the best value. To be precise, we select "very good" as best value for the health dimension. Not being unemployed is selected as the best value in the unemployment dimension, meeting every day with friends is the best value for the social interaction dimension and not feeling unsafe the best value for the personal safety dimension.

Education has a positive but small effect on life satisfaction (not reported). This low economic significance of education is in line with, for example, the results in Fleurbaey *et al*. (2009). Arguably, the education variable affects life satisfaction in two ways. First, it can be considered as a relevant dimension of well-being. Fixing its best value is not obvious, however, since being better educated is – at least theoretically – not naturally bounded and, more importantly, it is not reasonable to assume that the best value for education is uniform for everyone. On the other hand, it can also be argued that education affects expectations and aspirations and should therefore rather be seen as part of the vector z_i of conditioning variables. The problem is that our technique of estimating preferences through a life satisfaction regression does not allow us to disentangle these two effects empirically.[27] Each variable has to be classified in one and only one category (it is either a life dimension x_i or a personal characteristic z_i). We have opted to treat education not as a life dimension, but as a variable influencing aspirations. We performed a sensitivity analysis, however. Given the rather small direct effect of education on life satisfaction, taking it up in the calculation of equivalent incomes does not change any of our substantial results.

5. WELL-BEING AND SOCIAL PROGRESS IN EUROPE

The criterion proposed in this paper to evaluate well-being while taking the various life dimensions and inequality into account is given by expression (1). Social welfare is measured by *SW,* progress (regress) is measured by changes in *SW.* These results will be given in Tables 10-12. To facilitate the interpretation of these results, we first focus on average equivalent incomes and on inequality separately. Table 7 summarizes the main results for the average equivalent incomes. The first two columns present the results for 2008, the third and the fourth column those for 2010 and the two

[25] The result about safety may seem surprising. One possible explanation is that our "safety"-variable basically measures *feelings* of unsafety. If these "feelings" are different for males and females (in that females feel more unsafe in similar neighbourhoods) this may have an effect on the estimated coefficient. However, this is not a problem for the calculation of equivalent incomes, since in this calculation the stronger feelings of unsafety among women will be captured by the observed values of $f(x_i)$.

[26] See also the theoretical analysis in Fleurbaey and Blanchet (2013).

[27] The problem does not occur with the other two methods of estimating preferences. Since each of these methods has its own weak and strong points, it would certainly be advisable to compare the results obtained with each of them. At this moment, however, there is no data set that allows us to do so.

last columns show the yearly growth rates. In each case we give the results for monetary incomes and for equivalent incomes with the full list of dimensions summarized in Table 4.

[insert Table 7 about here]

The first column presents the average monetary incomes for 2008. With our data, the average income coincides with the "real net national income" macro variable. The ranking of the countries is given in italics. Norway is the richest country in our sample, followed by the Netherlands and Sweden. Hungary is the poorest country. The second column gives the average level of the equivalent incomes with all dimensions included. In 2008 the highest average equivalent income was reached by Norway, Denmark and Switserland, while the citizens of Russia, Hungary, Estonia and Poland were worst-off on average. As discussed before, adding dimensions necessarily lowers equivalent incomes (except in the unrealistic case in which all citizens of a country reach the best possible value for all the added dimensions). Therefore it is not meaningful to compare the values across columns. What is meaningful, is a comparison of the rankings of the countries within and across columns. The most striking differences between the two rankings are the worsening of the position of Germany (DE) and the Netherlands and the improvement of the position of Denmark. Below we return to the interpretation of these shifts.

The situation in 2010 (in the third and fourth column of Table 7) is very similar. This is reassuring, as we should not expect large structural changes in these average levels over a period of only two years. The last two columns of Table 7 show yearly growth rates between 2008 and 2010. With the exception of three countries (Germany, Poland and, most outspokenly, Switzerland) all countries suffered from negative growth rates when only income is considered as a dimension of life. In particular, Estonia and Greece were heavily hit by the financial crisis and the effects of a bursting real estate market bubble (in Estonia) and a government debt crisis (in Greece). The changes in average well-being are different however. In Belgium, Spain, Slovenia and (especially) Sweden and Russia the negative income growth goes together with an improvement in average well-being. For Germany, the development of average well-being is also more positive than that of income. On the other hand, the growth performance in terms of well-being is worse than that in terms of income for Switzerland, the Netherlands and France. It is also interesting to compare the two countries with an extremely negative income growth: Estonia and Greece. While the Estonian performance improves a little when adding other dimensions, the Greek situation gets even worse. Growth in well-being is largest (and positive) in Sweden, Switzerland, Russia, and Germany – it is lowest (and strongly negative) in Greece, the Czech Republic, Estonia, and France.

Interpreting the changes of the equivalent incomes is complicated by the presence of composition effects. Suppose, for instance, that the average health level in a country improves, but that this average increase results from an improvement in the health of individuals that care less about healthy (for example the young) while at the same time the health of individuals that care more worsens. The average equivalent incomes may then decrease, even if average health in the country increases. Accounting for such compositional effects is one of the main objectives of our approach.

[insert Table 8 about here]

Despite this caveat, it is useful to look at the relative importance of the different dimensions. This information is shown in Table 8 for 2008 (results for 2010 are very similar and not reported). The

first column gives average monetary incomes and coincides with the first column in Table 7. The sixth column shows average equivalent incomes with all the dimensions included and coincides with the second column in Table 7. The columns in between present the hypothetical equivalent incomes when each time only one dimension is included (in addition to income). In other words, the third column presents the average equivalent incomes when income and health are seen as life dimensions, the next column presents average equivalent incomes when income and unemployment are treated as life dimensions, and so on. This makes it possible to evaluate the effect of each of the dimensions in separation. The right hand part of Table 8 gives for each of the dimensions separately and (in the last column) for all dimensions together the difference in percentages between average income and the respective values of average equivalent income (i.e. well-being). As noted before, introducing an additional dimension necessarily lowers the measure of well-being.

Health turns out to have the largest effect on equivalent incomes. It gets a large weight in the preferences, and many respondents suffer from health problems. Very strong effects of ill-health are found for the East European countries and, more surprisingly, for Germany and the Netherlands. Greece, on the contrary, has a healthy population. To interpret these results correctly, it is important to keep in mind that we measure health by self-assessed health. Based on the SHARE data set (a representative sample of the elderly), Jürges (2007) has found that precisely for the Germans and the Dutch there seems to be some discrepancy between these subjective indicators and objective health information. Yet, from the perspective of measuring well-being it is an open question whether self-assessed health does not contain relevant information that is missing in the objective data. The second most important dimension is the quality of social interactions. Including social interactions has the smallest effect on equivalent incomes in Denmark, the Netherlands, Spain, and Norway. In these countries social interactions seem to be reasonably good. The (lack of) quality of social interactions has a strongly negative effect in Greece and Hungary. Feelings of safety are somewhat less important. The result for unemployment is striking: increasing unemployment has a rather minor effect on *average* well-being, mainly because it only hits the unemployed subpopulation. The largest negative effects are found in Greece, Hungary and Spain.

The relative importance of all the dimensions together can be read from the last column. The smaller the absolute value of the negative numbers in that column, the better the relative performance of that country in terms of the non-income dimensions. Good performers are Switzerland, Denmark, Norway and Sweden. Poor performing countries are Estonia, Hungary and Russia.

Let us now look at the inequality in our well-being measure. Table 9 presents the results for 2008 and 2010. We compare the inequality in equivalent incomes with traditional income inequality for two values of ρ. When ρ is set equal to 2, we obtain the Gini coefficient. The value ρ = 5 corresponds to a larger degree of bottom-sensitivity, i.e., a stronger focus on what happens to the people with the lowest (equivalent) incomes. Since the picture is rather similar for 2008 and 2010, we focus on the former year.

The first column of Table 9 gives the results for the inequality in money incomes.[28] Again we present the ranks in italics, but now higher ranks reflect more unequal countries – a lower rank therefore indicates a preferred situation. The Czech Republic and the Scandinavian countries have the most

[28] As the income data in the European Social Survey are not perfect, the Gini coefficients in Table 9 do not correspond perfectly to the Gini coefficients obtained from macro data (see Appendix 1).

equal income distribution. Income inequality is largest in Great Britain, Switzerland, Poland and Russia. The second column of Table 9 shows the inequality in well-being. The most striking fact is the spectacular increase in inequality for all countries, indicating the phenomenon of cumulative deprivation. Inequality in other dimensions does not compensate for income inequality, but increases overall inequality considerably. There are also shifts in the relative positions of the countries. The Scandinavian countries remain at the top, but for other countries the differences are quite dramatic. Switzerland and Great Britain, for instance, are (relative to other countries) less unequal in equivalent incomes compared to standard incomes (although the inequality in Great Britain remains high with equivalent incomes also). The Eastern European countries (the Czech Republic, Hungary, Slovenia and Estonia) are relatively to the other countries more unequal when we include the non-income dimensions in our measure of well-being.

[insert Table 9 about here]

We can now construct the overall distribution-sensitive measure of social welfare by combining in a multiplicative way the information on average (equivalent) incomes as given in Table 7 with the information on inequality from Table 9. These results are presented in Table 10 and Table 11 for 2008 and 2010 respectively. The yearly growth rates are shown in Table 12. The columns with $\rho = 1$ repeat the corresponding results for the averages, since $\rho = 1$ corresponds to the utilitarian perspective that focuses only on average equivalent income. We include them nevertheless for the sake of comparison. This comparison immediately yields a surprising result. Introducing distribution-sensitivity does indeed change the relative ranking of some countries, but these changes are rather minor and they are more outspoken when we only focus on income compared to the situation in which we also include the other dimensions. The explanation is that the relative differences in the averages are much larger for equivalent incomes than for traditional incomes (compare the columns with $\rho = 1$) and therefore the differences in *M* have a much larger effect on social welfare, as given by equation (1). This suggests that the intercountry differences when moving from incomes to equivalent incomes are mainly driven by the average levels. This is indeed what we find. Some countries do considerably better in terms of equivalent incomes than in terms of incomes: Switzerland, Denmark, Poland, even Greece. Some do worse: Germany and the Netherlands.

[insert Table 10 and Table 11 about here]

Looking at the country rankings for social welfare as defined in equation (1), i.e., the right hand part of Table 10 and Table 11, we obtain the (unsurprising) result that social welfare is largest in the Scandinavian countries and in Switzerland, followed by Great Britain, the Netherlands and Belgium. Note that Great Britain does relatively worse when we strengthen the concern for the poor, i.e., increase the bottom-sensitivity in our inequality measure. Social welfare is lowest in the Eastern European countries (the Czech Republic, Slovenia, Poland, Estonia, Hungary, and Russia).

Finally, in Table 12, we show the yearly growth rate in social welfare. Note that there are large differences between the country ranking based on growth figures and the ranking based on the overall level of well-being reached. Since we have commented already on the differences between average income growth and average growth in well-being (the numbers given in the columns with $\rho = 1$), we will now focus on the effect of increasing the weight given to the worst-off in the right hand part of the table. Some countries do much better when we evaluate their performance with a social

welfare function that gives a larger weight to distributional issues: Belgium and Hungary. Some do worse: Germany and Spain. Moreover, the growth results for Spain are deeply negative and we observe a really dramatic negative development in Greece (up to -25%). The financial crisis has obviously been especially severe for the worst-off groups in countries as Spain and Greece and this comes out most prominently when looking at a rich measure of well-being in a distribution-sensitive way.

[insert Table 12 about here]

So far we have focused on inter-country comparisons. Alternatively, one can zoom in on specific countries. Yet, this perspective requires ideally an in-depth analysis accounting for the compositional effects due to the different trends of the outcomes for socioeconomic groups with different preferences. Let us nevertheless give two examples. The first is Greece. Although subjective health in Greece is above average, it is low in the ranking of average equivalent incomes both in 2008 and in 2010. Between these two years it had the largest negative growth in equivalent incomes (-9.04%). When including distributional considerations its growth rate becomes even more negative, as the worst-off in the Greek society are hit most severely. We pointed already to the dramatic social regress between 2008 and 2010 for a bottom-sensitive social welfare function.

A second example is Germany. Its overall ranking in terms of well-being is less favorable than its ranking in terms of income. This is mainly due to a worse score for subjective health (with the caveats mentioned above). Moreover, Germany has a larger inequality, both in incomes and in well-being. Between 2008 and 2010 it had positive growth rates when we only consider incomes or average well-being – it had negative growth in well-being when we take the distribution into account. This is especially true for a social welfare function with an outspoken concern for the weakest groups in society. It is not very meaningful to look in this way at all the countries, nor should one forget the relative fragility of our data set. It seems clear, nevertheless, that the notion of well-being can be made operational in an attractive way.

6. CONCLUSION

With this paper we illustrated that it is possible to calculate measures of the level of well-being and its inequality in a coherent way by making use of data that can easily be collected with a representative questionnaire study. This is not to say that our empirical results are beyond doubt. Let us therefore state clearly the four different levels in our reasoning.

At a first level, one finds the basic principles. Two ideas are especially important. In our view, a satisfactory index of social well-being has to account for the fact that the weights attached to the different dimensions may not be the same across different individuals. Moreover, the construction of a synthetic index of well-being is desirable. Such a synthetic index is needed to capture the important phenomenon of cumulative deprivation. Of course, other observers may have different ethical views, e.g., on the importance of subjective happiness. There is room for debate, but this debate should focus on the ethical foundation of the principles, rather than on the empirical implementation.

At a second level, we proposed the idea of equivalent income. To the best of our knowledge, equivalent income is the most attractive measure of well-being satisfying our basic principles. Its main weakness is the justification of the reference values.

Equivalent incomes can be operationalized with different techniques. This is the third level. In this paper we applied the subjective satisfaction method, but this method has its weaknesses. It can only capture group-wise differences in preferences (and not the differences between individuals) and it has difficulties to distinguish between the well-being and the aspirational effects of specific variables. Moreover subjective variables (such as self-assessed health) are in general more strongly correlated with life satisfaction than objective variables. Certainly when one cannot sufficiently correct for endogeneity, subjective variables then will tend to be overweighted in the calculation of equivalent incomes. This is a main issue. In the future, the results with different techniques should be compared and put together to get a more robust picture of well-being.

Finally, at the lowest level, we situate our own empirical application with data from the European Social Survey in 2008 and 2010. These data are far from perfect and therefore our empirical results should interpreted cautiously. What is important, however, is to realize that measuring well-being taking multiple life dimensions and inequality into account is possible.

We have built into our exercise the possibility of different degrees of inequality aversion – ranging from completely disregarding inequality at one extreme to looking only at the poorest at the other extreme. Sensitivity analysis with respect to this parameter allows for an open debate about its implications. The idea of sensitivity analysis can be exploited further. More specifically, it would be interesting to build in a sensitivity analysis with respect to the life dimensions that are included in the measurement exercise. As a matter of fact, if one includes affective happiness as one of the life dimensions, the happiness approach can be integrated in the sensitivity analysis in a convenient way. A precondition for this is the development of robust measures of satisfaction that make it possible to distinguish its cognitive and affective components.

We have emphasized throughout this paper that the choice of a well-being measure for policy evaluation is an ethical and political question. Normative views may diverge, and it is therefore meaningful to compare and discuss the results obtained with different approaches. This should result in a political debate about the content of the arguments within a coherent theory of justice. Justice remains important in society even if only a minority of the population care about it. Our claim that individual preferences about life dimensions should be respected is an ethical position and is not based on these individual preferences themselves. It is crucial to distinguish these two layers in all discussions about measuring well-being and social progress.

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APPENDIX 1. UPRATING PROCEDURE FOR TOTAL HOUSEHOLD INCOMES

The income information in ESS is based on the following question "please tell me which letter describes your household's total income, after tax and compulsory deductions, from all sources? If you don't know the exact figure, please give an estimate." To answer the question, the respondents make use of a country and wave specific showcard that contains 10 decile values estimated on an alternative data source (often SILC or administrative data). We have taken several steps to construct incomes based on these reported letters.

In the first step, every letter is converted to its corresponding monetary value. For the first nine deciles, we selected the midpoint of each decile, assuming an approximately uniform distribution within each decile. Things are more intricate for the top decile, as that is defined as "*y* or up", were *y* denotes the decile value of the 10th decile. We select the monetary value corresponding to the top decile by searching on a fine grid for the monetary value that leads to the equivalized income distribution with the Gini coefficient which is closest to the Gini coefficient of SILC in 2008.[29] For most countries we could select a monetary value for the top decile such that the Gini corresponds very well to the external source. Yet, for Czech Republic, Greece and Norway in 2008 the income distribution used in this analysis underestimates the inequality, whereas for Slovenia inequality is too high. In 2010, the figures for Denmark, France , the Netherlands and Slovenia are based on underestimations of inequality and those for Norway are too large. Yet, the discrepancies between the Gini coefficient used here and the Gini coefficient from SILC overall remain reasonable.

In the second step, the obtained income distribution is uprated, such that the average corresponds to the "Real net national income at the price levels and PPPs of 2005" as provided by the OECD.[30] This uprating corrects for missing income components and price differences across the different countries and waves. Note that this uprating leads by construction to a perfect correspondence between the average income and the macro-figures and that it does not affect the (relative) Gini coefficient. Moreover, as the specification of the happiness equation (expression 4) includes income after a logarithmic transformation in an estimation with time and country dummies, the coefficient of income is not affected by the uprating.

[29] Downloaded on 31 January 2013 from the Eurostat website http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_di12

[30] Downloaded on 28 January 2013 from the OECD website http://www.oecd-ilibrary.org/economics/real-net-national-income_2074384x-table16

Figure 1. Weights in the S-Gini social welfare function at each percentile

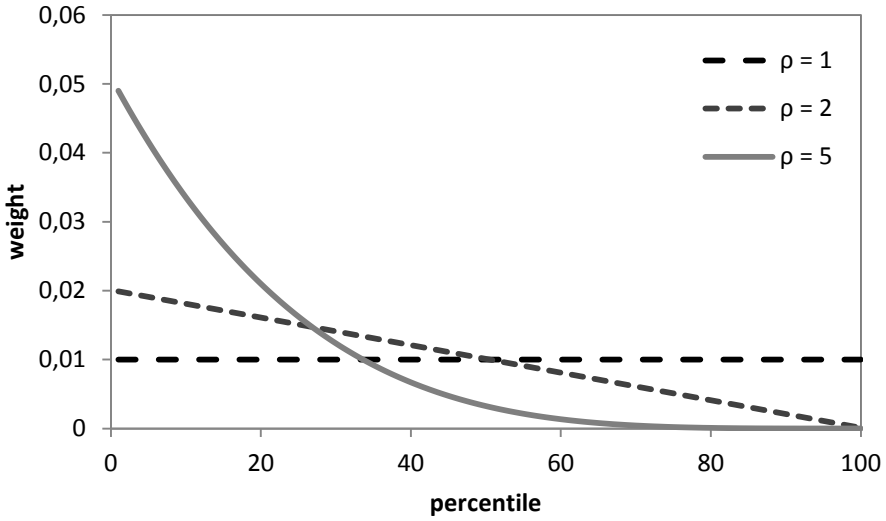

Figure 2. Two individuals with the same preferences

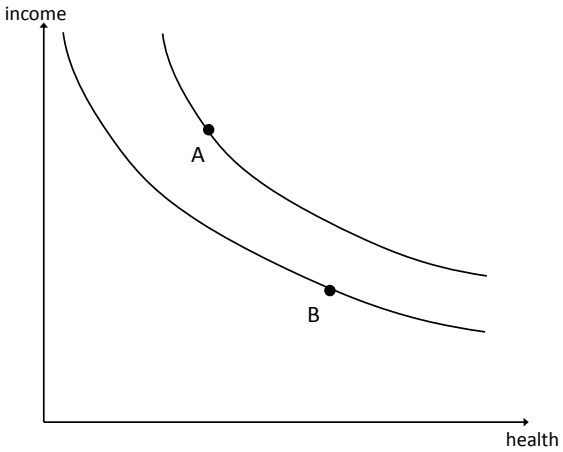

Figure 3. The concept of equivalent income

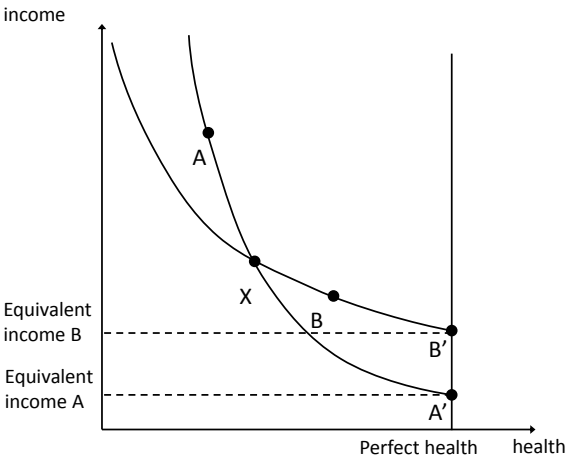

Table 1 Lists of dimensions

European Statistical System (2011)	**OECD (2011)**
Material living conditions	Income and wealth Housing conditions
Education	Education and skills
Natural and living environment	Environmental quality
Productive and valued activities	Job and earnings
Health	Health status
Leisure and social interactions	Work-life balance Social connections
Experience of life	Subjective well-being
Governance and basic rights	Civic engagement and governance
Economic and physical security	Personal security

Table 2 Structuring the information

	dimension 1	dimension 2	...	dimension k	well-being
individual 1	x_{11}	x_{12}	...	x_{1k}	$W_1(x_{11}, x_{12}, \dots, x_{1k})$
individual 2	x_{21}	x_{22}	...	x_{2k}	$W_2(x_{21}, x_{22}, \dots, x_{2k})$
...	...	...	...	...	
individual n	x_{n1}	x_{n2}	...	x_{nk}	$W_n(x_{n1}, x_{n2}, \dots, x_{nk})$
AGGREGATE	X_1	X_2	...	X_k	$SW(W_1, W_2 \dots, W_n)$
DISTRIBUTIONAL INDICATOR	$I(x_{11}, \dots, x_{n1})$	$I(x_{12}, \dots, x_{n2})$	...	$I(x_{1k}, \dots, x_{nk})$	$I(W_1, W_2, \dots, W_n)$

Table 3 Aggregation and distribution: an hypothetical example

SITUATION A

	income	**health**	**well-being**
individual 1	100	10	55
individual 2	10	100	55
Average	*55*	*55*	*55*
distribution	*10/1*	*10/1*	*1/1*

SITUATION B

	income	**health**	**well-being**
individual 1	100	100	100
individual 2	10	10	10
average	*55*	*55*	*55*
distribution	*10/1*	*10/1*	*10/1*

Table 4 Dimensions included in the analysis

Life dimensions	**Variable in ESS**
Material living conditions	Total household income per capita (after uprating)
Health	Self-reported health
Productive and valued activities	Unemployment status
Leisure and social interactions	Indicator of how often the respondent meets socially with friends, relatives or colleagues.
Economic and physical security	Indicator of whether the respondent feels safe when walking alone in local area after dark

Table 5 Summary statistics of key variables

Cntry	Year	Satisf. [0..10]	Income	Health [1..5]	Unempl. (in %)	Social [1..7]	Safe [1..4]	Young (in %)	Female (in %)	High. Educ
BE	2008	7,27	27783	3,94	5,4%	5,16	3,00	54,9%	50,9%	32,4%
BE	2010	7,51	27477	3,95	5,5%	5,23	3,02	53,4%	51,9%	39,7%
CH	2008	7,96	30300	4,17	2,8%	5,22	3,28	57,2%	53,5%	26,6%
CH	2010	8,14	34757	4,13	2,1%	5,22	3,26	51,7%	48,7%	29,5%
CZ	2008	6,65	18287	3,74	4,4%	4,77	2,77	57,3%	51,3%	12,0%
CZ	2010	6,41	16729	3,74	6,1%	4,70	2,77	60,5%	49,0%	22,8%
DE	2008	6,95	28933	3,67	4,7%	4,78	3,03	50,1%	46,6%	35,4%
DE	2010	7,26	28986	3,63	3,9%	4,90	3,02	52,5%	48,5%	32,6%
DK	2008	8,52	29171	4,08	2,4%	5,42	3,28	47,8%	50,4%	39,8%
DK	2010	8,35	28162	4,05	4,4%	5,49	3,35	49,9%	48,7%	37,1%
EE	2008	6,20	15699	3,40	5,2%	4,54	2,76	51,5%	57,6%	36,6%
EE	2010	6,52	12999	3,45	6,1%	4,24	2,90	49,5%	59,7%	41,6%
ES	2008	7,31	23326	3,82	6,1%	5,45	2,92	58,7%	51,8%	23,3%
ES	2010	7,30	22282	3,71	11,9%	5,33	3,06	57,6%	51,5%	28,0%
FI	2008	7,94	27696	3,80	3,4%	5,09	3,25	50,2%	50,9%	30,6%
FI	2010	7,94	25828	3,78	5,1%	5,09	3,29	48,1%	51,5%	39,1%
FR	2008	6,35	26593	3,82	5,5%	5,22	3,08	55,6%	54,0%	30,8%
FR	2010	6,34	25779	3,80	6,5%	5,13	3,03	51,2%	52,3%	26,3%
GB	2008	7,08	31142	3,97	4,3%	4,99	2,80	56,5%	52,4%	44,0%
GB	2010	7,17	29794	3,93	5,3%	4,98	2,91	52,8%	54,6%	31,8%
GR	2008	6,06	21938	4,33	9,1%	4,17	2,64	65,6%	53,9%	24,6%
GR	2010	5,71	19388	4,22	11,8%	3,90	2,55	57,2%	55,6%	21,9%
HU	2008	5,29	13887	3,42	8,3%	3,80	2,71	52,1%	53,7%	20,1%
HU	2010	5,84	13244	3,45	6,4%	3,67	2,72	52,1%	54,2%	23,5%
NL	2008	7,69	31789	3,89	1,7%	5,42	2,98	52,0%	51,3%	31,9%
NL	2010	7,77	30497	3,82	2,4%	5,40	3,01	50,6%	53,1%	30,0%
NO	2008	7,89	43027	4,04	1,4%	5,48	3,40	57,4%	47,9%	43,8%
NO	2010	7,93	41706	4,04	3,8%	5,56	3,38	54,8%	50,4%	43,6%
PL	2008	6,87	14262	3,62	4,6%	4,28	3,03	56,3%	52,8%	21,9%
PL	2010	7,00	15038	3,68	6,3%	4,29	3,07	56,5%	51,9%	24,3%
RU	2008	5,47	14367	3,22	4,5%	4,42	2,65	59,0%	57,6%	52,6%
RU	2010	5,70	13020	3,31	5,3%	4,49	2,79	59,7%	57,8%	51,9%
SE	2008	7,86	31161	4,03	3,0%	5,38	3,25	52,9%	49,8%	26,3%
SE	2010	7,91	30379	4,04	3,7%	5,41	3,25	50,0%	52,0%	37,3%
SI	2008	6,93	22199	3,57	3,8%	4,49	3,14	56,1%	53,7%	20,8%
SI	2010	6,97	20205	3,65	6,1%	4,60	3,25	51,7%	53,5%	20,5%

Table 6 Coefficients of dimensions and interaction effects in the life satisfaction regression

	life satisfaction	
income (logarithm)	0.375***	(0.0198)
health (τ = 0.62)	1.010***	(0.0196)
unemployed	-0.820***	(0.0532)
social interaction (τ = 0.34)	0.380***	(0.0142)
safety (τ = 0.95)	0.241***	(0.0177)
female × income	0.0441+	(0.0228)
high education × income	0.0148*	(0.00683)
young × health	-0.0217+	(0.0129)
high education × health	-0.0735*	(0.0311)
female × unemployed	0.225**	(0.0744)
female × safety	-0.0590**	(0.0221)
N	52137	
pseudo R^2	0.085	

Standard errors in parentheses (+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$). Results from ordered logit regression including as controls: household size, education, education squared, gender, age, age (squared), marital status, dummies for being religious, urban, belonging to ethnic minority, time and country.

Table 7 Average (Equivalent) Incomes and growth between 2008 and 2010 (ranks in italics)

	2008		2010		Growth	
Country	Income	Equi. Inc.	Income	Equi. Inc.	Income	Equi. Inc.
BE	27783	4669	27477	4674	-0.55%	0.05%
	8	*8*	*8*	*6*	*4*	*8*
CH	30300	8025	34757	8659	7.35%	3.95%
	5	*3*	*2*	*2*	*1*	*2*
CZ	18287	2379	16729	2011	-4.26%	-7.74%
	14	*14*	*14*	*14*	*14*	*17*
DE	28933	3435	28986	3637	0.09%	2.94%
	7	*12*	*6*	*10*	*3*	*4*
DK	29171	8291	28162	7626	-1.73%	-4.01%
	6	*2*	*7*	*4*	*8*	*12*
EE	15699	1423	12999	1227	-8.60%	-6.89%
	15	*16*	*18*	*16*	*18*	*16*
ES	23326	3459	22282	3499	-2.24%	0.58%
	11	*11*	*11*	*11*	*11*	*7*
FI	27696	4732	25828	4297	-3.37%	-4.60%
	9	*7*	*9*	*8*	*13*	*13*
FR	26593	4547	25779	3963	-1.53%	-6.42%
	10	*9*	*10*	*9*	*6*	*15*
GB	31142	6026	29794	5923	-2.16%	-0.85%
	4	*5*	*5*	*5*	*10*	*9*
GR	21938	3476	19388	2848	-5.81%	-9.04%
	13	*10*	*13*	*13*	*17*	*18*
HU	13887	891	13244	863	-2.32%	-1.55%
	18	*17*	*16*	*18*	*12*	*10*
NL	31789	5090	30497	4609	-2.03%	-4.73%
	2	*6*	*3*	*7*	*9*	*14*
NO	43027	11773	41706	11044	-1.54%	-3.10%
	1	*1*	*1*	*1*	*7*	*11*
PL	14262	1548	15038	1615	2.72%	2.16%
	17	*15*	*15*	*15*	*2*	*5*
RU	14367	827	13020	890	-4.69%	3.79%
	16	*18*	*17*	*17*	*16*	*3*
SE	31161	7234	30379	7973	-1.25%	5.11%
	3	*4*	*4*	*3*	*5*	*1*
SI	22199	2824	20205	2889	-4.49%	1.15%
	12	*13*	*12*	*12*	*15*	*6*

Table 8 Dimension contributions to equivalent income in 2008

Country	Income	Health	Unempl.	Social.	Safety	Equi.Inc.	Health	Unempl.	Social.	Safety	Equi.Inc.
BE	27783	10716	26884	17286	18394	4669	-61%	-3%	-38%	-34%	-83%
CH	30300	15290	29906	19119	23091	8025	-50%	-1%	-37%	-24%	-74%
CZ	18287	6315	17884	10032	10558	2379	-65%	-2%	-45%	-42%	-87%
DE	28933	8503	28255	15742	19644	3435	-71%	-2%	-46%	-32%	-88%
DK	29171	14953	28856	19517	22760	8291	-49%	-1%	-33%	-22%	-72%
EE	15699	3801	15306	8490	9442	1423	-76%	-3%	-46%	-40%	-91%
ES	23326	8031	22368	15235	14690	3459	-66%	-4%	-35%	-37%	-85%
FI	27696	9769	27171	16639	20640	4732	-65%	-2%	-40%	-25%	-83%
FR	26593	9309	25923	16874	18785	4547	-65%	-3%	-37%	-29%	-83%
GB	31142	15211	30501	18591	19938	6026	-51%	-2%	-40%	-36%	-81%
GR	21938	13089	20861	9461	12688	3476	-40%	-5%	-57%	-42%	-84%
HU	13887	3101	13241	5655	7852	891	-78%	-5%	-59%	-43%	-94%
NL	31789	10632	31533	21365	20705	5090	-67%	-1%	-33%	-35%	-84%
NO	43027	20083	42655	29230	34692	11773	-53%	-1%	-32%	-19%	-73%
PL	14262	4113	13948	6776	9370	1548	-71%	-2%	-52%	-34%	-89%
RU	14367	2445	14133	7279	8060	827	-83%	-2%	-49%	-44%	-94%
SE	31161	14098	30638	20367	23381	7234	-55%	-2%	-35%	-25%	-77%
SI	22199	6292	21830	11662	15570	2824	-72%	-2%	-47%	-30%	-87%

Table 9 Inequality of incomes and equivalent incomes in 2008 and 2010 for various values of the bottom sensitivity parameter (ranks in italics)

	2008				2010			
	Income		Equivalent income		Income		Equivalent income	
Country	ρ = 2	ρ = 5	ρ = 2	ρ = 5	ρ = 2	ρ = 5	ρ = 2	ρ = 5
BE	0.31	0.54	0.66	0.90	0.31	0.52	0.66	0.91
	7	*7*	*5*	*5*	*8*	*5*	*5*	*3*
CH	0.37	0.59	0.66	0.90	0.34	0.57	0.65	0.91
	17	*16*	*6*	*6*	*14*	*13*	*3*	*3*
CZ	0.25	0.45	0.70	0.93	0.27	0.46	0.73	0.95
	1	*1*	*11*	*12*	*1*	*1*	*10*	*12*
DE	0.34	0.57	0.70	0.93	0.33	0.56	0.73	0.95
	13	*11*	*12*	*10*	*11*	*9*	*11*	*9*
DK	0.27	0.49	0.62	0.90	0.28	0.51	0.64	0.91
	3	*3*	*2*	*4*	*3*	*4*	*2*	*5*
EE	0.34	0.57	0.76	0.95	0.34	0.57	0.78	0.96
	11	*12*	*18*	*17*	*13*	*11*	*18*	*17*
ES	0.35	0.57	0.70	0.93	0.38	0.61	0.74	0.95
	15	*13*	*12*	*11*	*18*	*17*	*12*	*13*
FI	0.29	0.52	0.67	0.91	0.29	0.52	0.68	0.93
	6	*5*	*7*	*7*	*4*	*6*	*7*	*7*
FR	0.33	0.56	0.68	0.92	0.33	0.57	0.70	0.93
	10	*8*	*9*	*8*	*10*	*12*	*8*	*7*
GB	0.39	0.65	0.69	0.94	0.36	0.62	0.71	0.95
	18	*18*	*10*	*13*	*16*	*18*	*9*	*11*
GR	0.35	0.56	0.68	0.93	0.36	0.60	0.75	0.96
	14	*10*	*8*	*9*	*17*	*15*	*13*	*14*
HU	0.29	0.53	0.75	0.96	0.30	0.53	0.76	0.96
	5	*6*	*16*	*18*	*6*	*7*	*17*	*18*
NL	0.32	0.56	0.64	0.88	0.30	0.54	0.67	0.91
	8	*9*	*4*	*1*	*7*	*8*	*6*	*2*
NO	0.27	0.48	0.62	0.89	0.29	0.50	0.64	0.91
	2	*2*	*2*	*3*	*4*	*2*	*1*	*1*
PL	0.36	0.60	0.74	0.95	0.36	0.61	0.76	0.96
	16	*17*	*14*	*15*	*15*	*16*	*16*	*14*
RU	0.34	0.58	0.76	0.95	0.33	0.59	0.75	0.95
	12	*15*	*17*	*14*	*12*	*14*	*13*	*9*
SE	0.28	0.50	0.62	0.89	0.28	0.50	0.66	0.91
	4	*4*	*1*	*2*	*2*	*2*	*4*	*5*
SI	0.32	0.58	0.74	0.95	0.32	0.57	0.75	0.96
	9	*14*	*15*	*16*	*9*	*10*	*15*	*16*

Table 10 Social welfare of incomes and equivalent incomes in 2008 for various values of the bottom sensitivity parameter (ranks in italics)

	Income			Equivalent income		
Country	**ρ = 1**	**ρ = 2**	**ρ = 5**	**ρ = 1**	**ρ = 2**	**ρ = 5**
BE	27783	19309	12864	4669	1611	458
	8	*6*	*6*	*8*	*7*	*6*
CH	30300	19059	12423	8025	2753	770
	5	*8*	*8*	*3*	*4*	*4*
CZ	18287	13697	10040	2379	726	159
	14	*14*	*11*	*14*	*13*	*13*
DE	28933	19125	12441	3435	1041	251
	7	*7*	*7*	*12*	*12*	*11*
DK	29171	21236	14906	8291	3159	837
	6	*4*	*3*	*2*	*2*	*2*
EE	15699	10440	6735	1423	346	67
	15	*15*	*15*	*16*	*16*	*16*
ES	23326	15069	9984	3459	1048	249
	11	*12*	*12*	*11*	*11*	*12*
FI	27696	19609	13266	4732	1562	416
	9	*5*	*5*	*7*	*8*	*7*
FR	26593	17764	11754	4547	1446	355
	10	*10*	*9*	*9*	*9*	*9*
GB	31142	18903	10869	6026	1850	380
	4	*9*	*10*	*5*	*5*	*8*
GR	21938	14326	9587	3476	1116	261
	13	*13*	*13*	*10*	*10*	*10*
HU	13887	9860	6569	891	219	34
	18	*16*	*16*	*17*	*17*	*18*
NL	31789	21648	14019	5090	1848	621
	2	*3*	*4*	*6*	*6*	*5*
NO	43027	31582	22546	11773	4486	1283
	1	*1*	*1*	*1*	*1*	*1*
PL	14262	9199	5691	1548	398	79
	17	*18*	*18*	*15*	*15*	*15*
RU	14367	9540	6063	827	203	45
	16	*17*	*17*	*18*	*18*	*17*
SE	31161	22592	15736	7234	2763	810
	3	*2*	*2*	*4*	*3*	*3*
SI	22199	15073	9435	2824	723	138
	12	*11*	*14*	*13*	*14*	*14*

Table 11 Social welfare of incomes and equivalent incomes in 2010 for various of the bottom sensitivity parameter (ranks in italics)

	Income			Equivalent income		
Country	**ρ = 1**	**ρ = 2**	**ρ = 5**	**ρ = 1**	**ρ = 2**	**ρ = 5**
BE	27477	19097	13299	4674	1575	425
	8	*7*	*6*	*6*	*6*	*6*
CH	34757	22940	14841	8659	3022	788
	2	*2*	*3*	*2*	*2*	*2*
CZ	16729	12212	8983	2011	543	105
	14	*14*	*11*	*14*	*14*	*14*
DE	28986	19450	12754	3637	971	200
	6	*6*	*7*	*10*	*10*	*10*
DK	28162	20164	13828	7626	2738	656
	7	*5*	*5*	*4*	*4*	*4*
EE	12999	8631	5590	1227	267	50
	18	*18*	*17*	*16*	*16*	*16*
ES	22282	13904	8668	3499	913	168
	11	*11*	*13*	*11*	*11*	*11*
FI	25828	18415	12423	4297	1362	301
	9	*9*	*8*	*8*	*8*	*8*
FR	25779	17401	11059	3963	1189	277
	10	*10*	*10*	*9*	*9*	*9*
GB	29794	19038	11262	5923	1706	314
	5	*8*	*9*	*5*	*5*	*7*
GR	19388	12331	7716	2848	726	128
	13	*13*	*14*	*13*	*13*	*12*
HU	13244	9337	6225	863	204	35
	16	*16*	*15*	*18*	*18*	*18*
NL	30497	21256	14120	4609	1539	429
	3	*4*	*4*	*7*	*7*	*5*
NO	41706	29736	20686	11044	4020	1038
	1	*1*	*1*	*1*	*1*	*1*
PL	15038	9700	5895	1615	392	73
	15	*15*	*16*	*15*	*15*	*15*
RU	13020	8710	5286	890	227	49
	17	*17*	*18*	*17*	*17*	*17*
SE	30379	21934	15068	7973	2743	686
	4	*3*	*2*	*3*	*3*	*3*
SI	20205	13780	8769	2889	731	124
	12	*12*	*12*	*12*	*12*	*13*

Table 12 Yearly growth rate in social welfare between 2008 and 2010 for incomes and equivalent incomes (ranks in italics)

	Income			Equivalent income		
Country	**ρ = 1**	**ρ = 2**	**ρ = 5**	**ρ = 1**	**ρ = 2**	**ρ = 5**
BE	-0.55%	-0.55%	1.69%	0.05%	-1.11%	-3.52%
	4	*5*	*4*	*8*	*6*	*4*
CH	7.35%	10.18%	9.73%	3.95%	4.89%	1.14%
	1	*1*	*1*	*2*	*2*	*2*
CZ	-4.26%	-5.42%	-5.26%	-7.74%	-12.59%	-17.21%
	14	*16*	*14*	*17*	*17*	*17*
DE	0.09%	0.85%	1.26%	2.94%	-3.35%	-10.12%
	3	*3*	*5*	*4*	*7*	*10*
DK	-1.73%	-2.53%	-3.62%	-4.01%	-6.67%	-10.85%
	8	*9*	*12*	*12*	*13*	*11*
EE	-8.60%	-8.67%	-8.51%	-6.89%	-11.33%	-12.40%
	18	*18*	*17*	*16*	*16*	*13*
ES	-2.24%	-3.87%	-6.59%	0.58%	-6.43%	-16.29%
	11	*13*	*16*	*7*	*12*	*16*
FI	-3.37%	-3.04%	-3.18%	-4.60%	-6.39%	-13.89%
	13	*12*	*10*	*13*	*11*	*14*
FR	-1.53%	-1.02%	-2.96%	-6.42%	-8.89%	-10.90%
	6	*7*	*9*	*15*	*15*	*12*
GB	-2.16%	0.36%	1.81%	-0.85%	-3.90%	-8.66%
	10	*4*	*2*	*9*	*9*	*8*
GR	-5.81%	-6.96%	-9.76%	-9.04%	-17.47%	-25.45%
	17	*17*	*18*	*18*	*18*	*18*
HU	-2.32%	-2.65%	-2.62%	-1.55%	-3.52%	1.00%
	12	*10*	*8*	*10*	*8*	*3*
NL	-2.03%	-0.91%	0.36%	-4.73%	-8.35%	-15.50%
	9	*6*	*6*	*14*	*14*	*15*
NO	-1.54%	-2.92%	-4.13%	-3.10%	-5.19%	-9.56%
	7	*11*	*13*	*11*	*10*	*9*
PL	2.72%	2.72%	1.80%	2.16%	-0.68%	-3.97%
	2	*2*	*3*	*5*	*5*	*5*
RU	-4.69%	-4.35%	-6.41%	3.79%	5.98%	4.79%
	16	*15*	*15*	*3*	*1*	*1*
SE	-1.25%	-1.46%	-2.12%	5.11%	-0.37%	-7.69%
	5	*8*	*7*	*1*	*4*	*7*
SI	-4.5%	-4.3%	-3.5%	1.2%	0.6%	-5.1%
	15	*14*	*11*	*6*	*3*	*6*